Amendments to the Claims

The listing of claims will replace all prior versions, and listings of claims in the application.

1. (Previously Presented) A method for selecting points for inclusion in a multipoint constellation, the method comprising:

grouping phase intervals into groups based on similarity of an aggregate impairment exhibited therein and calculating a characteristic set of one or more symbol estimates of one or more of the phase intervals for each of the groups; and

assigning constellation points for a current constellation index corresponding to a plurality of phase intervals, based on one or more characteristic sets corresponding thereto, wherein one or more characteristic sets include contributions of symbol estimates from the phase intervals associated with one or more constellation indices other than the current constellation index.

2. (Previously Presented) A method, as recited in claim 1, further comprising: performing the assigning collectively for each of J distinct constellation indices, where J>O, wherein the assigning includes:

selecting, for each of the J distinct constellation indices, successive candidate next constellation points that, based on the symbol estimates for the one or more characteristic sets corresponding to the current constellation index, satisfy a distance metric with respect to a last assigned constellation point for the current constellation index; and

assigning successive lowest power ones of the candidate next constellation points to respective ones of the J distinct constellation indices.

3. (Previously Presented) A method, as recited in claim 1, wherein each of the phase intervals corresponding to the current constellation index is a member of a same group; and

wherein the assigning further includes selecting a next constellation point such that a distance metric between a group-characteristic estimate thereof and a last selected constellation point for the current constellation index satisfies a minimum distance criterion.

4. (Previously Presented) A method as recited in claim 1, wherein at least two phase intervals corresponding to the current constellation index are members of different groups; and

wherein the assigning further includes selecting a next constellation point such that a distance metric between group-characteristic estimates thereof and a last selected constellation point for the constellation index satisfies a minimum distance criterion for the at least two phase intervals.

5. (Previously Presented) A method, as recited in claim 1, wherein the current

constellation index is a k^{th} one of six constellation indices, where $k \geq 0$; and

wherein a k^{th} one of the phase intervals, a $(k+6)^{th}$ one of the phase intervals, a $(k+12)^{th}$ one of the phase intervals and a $(k+18)^{th}$ one of the phase intervals each correspond to the constellation index.

6. (Previously Presented) A method, as recited in claim 1, wherein multiple phase intervals correspond to the current constellation index.

7. (Previously Presented) A method, as recited in claim 1, wherein a single phase interval corresponds to the current constellation index.

8. (Previously Presented) A method, as recited in claim 1, wherein the phase intervals number twenty-four; and wherein the current constellation index is one of six constellation indices.

9. (Original) A method, as recited in claim 1, further comprising:

performing the grouping based on a received impairment compensation sequence that places at least one instance of each symbol from a predetermined set of symbols in each of the phase intervals.

10. (Original) A method, as recited in claim 1, further comprising:

communicating the constellation points to a remote communications device.

11. (Previously Presented) A method, as recited in claim 1, wherein the symbol estimates include amplitude estimates of pulse code modulation codewords.

12. (Previously Presented) A method, as recited in claim 1, wherein the distance metric includes a set difference measure based on respective amplitude estimates corresponding to representation groupings of pulse code modulation codewords.

13. (Previously Presented) In a communications system for communicating via a channel susceptible to one or more potential impairments each periodic in an integer N samples of a received signal, where N>1, a method for mapping constellation points to one or more constellations, the method comprising:

receiving a sequence of symbol estimates organized into N phases, a respective plurality of the phases corresponding to a particular one of J constellation indices where J>0;

grouping the N phases into a set of characteristic groups according to aggregate effects of the periodic impairments, if any, present in the N phases and without a priori identification of individual forms of the periodic impairments present therein; and

for the particular one of J constellation indices, selecting the constellation points based on one or more of the characteristic groups, the one or more of the characteristic groups being associated with the respective plurality of the phases.

14. (Previously Presented) A method, as recited in claim 13, wherein the selecting includes, for each of the J constellation indices, selecting successive candidate next constellation points that, based on the characteristic groups associated with the respective plurality of the phases, satisfy a distance metric with respect to a last assigned constellation point for the particular one of J constellation indices; and

assigning successive lowest power ones of the candidate next constellation points to respective constellation indices.

15. (Previously Presented) A method, as recited in claim 13, wherein the selecting of the constellation points for the particular one of J constellation indices includes:

calculating, for each associated characteristic group, a distance metric between a constellation point last added to the particular one of J constellation indices and estimates of a plurality of next lowest power constellation points; and

selecting for addition for the particular one of J constellation indices, one of the next lowest power constellation points for which the calculated distance metric exceeds a minimum distance metric for each associated characteristic group.

16. (Previously Presented) A method, as recited in claim 13, wherein the selecting of the constellation points for the particular one of J constellation indices includes:

for each associated one of the characteristic groups, finding a next lowest power constellation point for which a distance metric between an estimate of the next lowest

power constellation point and a constellation point last added to the particular one of J constellation indices exceeds a minimum distance metric; and

adding for the particular one of J constellation indices, a highest power one of the next lowest power constellation points associated with the characteristic groups.

17. (Previously Presented) A method, as recited in claim 13, wherein each of the N phases corresponding to a j^{th} constellation index is associated with a single characteristic group where $j \geq 0$ and

wherein selecting for a particular constellation corresponding to the j^{th} constellation index includes selecting for addition to the particular constellation, a next lowest power constellation point for which a distance metric between a constellation point last added to the particular constellation and an estimate of the next lowest power constellation point exceeds a minimum distance metric.

18. (Original) A method, as recited in claim 13, wherein N is 24.

19. (Original) A method, as recited in claim 13, wherein J is 6.

20. (Previously Presented) A communication device for communicating, using one or more constellations, via a channel susceptible to one or more potential impairments each periodic in an integer N samples of a received signal, the communications device comprising:

a receive path for receiving from the channel a sequence of symbols organized into N phase intervals, wherein a respective plurality of the phase intervals correspond to a particular one of J constellation indices where J>0; and

an impairment compensator coupled into the receive path during a training mode to receive the sequence of symbols and group the N phase intervals thereof into a set of characteristic groups according to aggregate effects of the periodic impairments, if any, the impairment compensator selecting, for the particular one of the J constellation indices, constellation points based on one or more of the characteristic groups, the one or more of the characteristic groups being associated with the respective plurality of the phase intervals corresponding thereto.

21. (Previously Presented) The communication device of claim 20 wherein the one or more of the characteristic groups associated with the respective plurality of the phase intervals corresponding to the at least one of the J constellation indices include contributions of symbol receptions of the sequence of symbols in grouped phase intervals corresponding to other constellation indices, such that selection of constellation points for the particular one of the J constellation indices is improved by symbol receptions from substantially all phase intervals exhibiting similar aggregate effects of the periodic impairments.

22. (Previously Presented) The communication device of claim 20, further comprising:

a transmit path, wherein the impairment compensator is coupled to the transmit path to supply an encoding of the constellation points selected by the impairment compensator to a remote communications device.

23. (Previously Presented) The communication device of claim 20, wherein for a particular received sequence, respective phase intervals corresponding to two or more indistinct ones of the J constellation indices are identically grouped; and

distinct ones of the J constellation indices number J.

24. (Original) The communication device of claim 20, wherein N is 24 and J is 6.

25. (Previously Presented) An apparatus comprising:

means for organizing a received sequence of symbol estimates into N phases where N is an integer greater than 1;

means for grouping the N phases into a set of characteristic groups according to correspondence of aggregate effects of periodic impairments, if any, present in the N phases; and

means for selecting constellation points for a constellation index corresponding to a plurality of the N phases using one or more of the received symbol estimates characteristic of one or more of the set of characteristic groups associated with the plurality of the N phases.

26. (Previously Presented) The apparatus of claim 25 wherein the means for selecting constellation points using one or more of the received symbol estimates characteristic of the one or more of the set of characteristic groups associated with the plurality of the N phases includes:

means for selecting candidate next constellation points for each of J distinct constellation indices, where J>0; and

means for assigning successive lowest power ones of the candidate next constellation points to respective constellations.

27. (Currently Amended) A computer program ~~product~~ stored on a computer readable medium comprising:

instructions executable on at least one processor to at least partially implement a communications device; and

said instructions including an impairment compensation subset thereof executable to group N phases of a symbol sequence received by the communications device into a set of characteristic groups according to correspondence of aggregate effects of periodic impairments, if any, present in the N phases, where N is an integer greater than 1, the impairment compensation subset of instructions selecting constellation points for a constellation index corresponding to a plurality of the N phases using one or more symbol estimates characteristic of the one or more characteristic groups associated with the plurality of the N phases.

28. (Currently Amended) A computer program ~~product~~ stored on a computer readable medium as in claim 27 wherein the instructions are encoded by or transmitted in at least one computer readable medium selected from the set of a disk, tape or other magnetic, optical, or electronic storage medium and a network, wireline, wireless or other communications medium.

29. (Previously Presented) The communication device of claim 20 further comprising a partial response class V (PRV) equalizer coupled in the receive path.

30. (Previously Presented) The method as recited in claim 9 further comprising using a partial response class V (PRV) equalizer on the received impairment compensation sequence.

31. (Previously Presented) The method of claim 13, wherein each of the characteristic groups exhibits a different impairment characteristic.

32. (Previously Presented) The method of claim 13, wherein the selecting of the constellation points includes identifying a symbol code for which symbol amplitude estimates from each of a plurality of the characteristic groups associated with the plurality of the phases exceed a symbol estimate associated with a last assigned constellation point.

33. (Previously Presented) The method of claim 13, wherein the plurality of the phases are timing phases, and each of the timing phases includes a symbol associated with an amplitude level.

34. (Previously Presented) The apparatus of claim 25, wherein each of the characteristic groups exhibits a different impairment characteristic.

35. (Previously Presented) The apparatus of claim 25, wherein the means for selecting constellation points includes means for identifying a symbol code for which symbol amplitude estimates from each of a plurality of the characteristic groups associated with the plurality of the N phases exceed a symbol estimate associated with a last assigned constellation point.

36. (Previously Presented) The method of claim 13, wherein the plurality of the phases are timing phases, and each of the timing phases includes a symbol associated with an amplitude level.